Appendix 5-4: Bird & Bat Post Construction Fatality Monitoring (PCFM) Protocol

Introduction

This document has been prepared by Turnstone Ecology and Xenops Environmental for Wood in relation to the proposed 500 MW Zarafshan Wind Farm development near Zarafshan City, Tamdy District, Navoi, Uzbekistan (the Project) (Figure 1). The Project is being developed by Masdar (the Developer) and implemented by Shamol Zarafshan Energy FE LLC (the Company) with the Power Purchase Agreement and Investment Agreement signed with the Uzbek Government in June 2020.

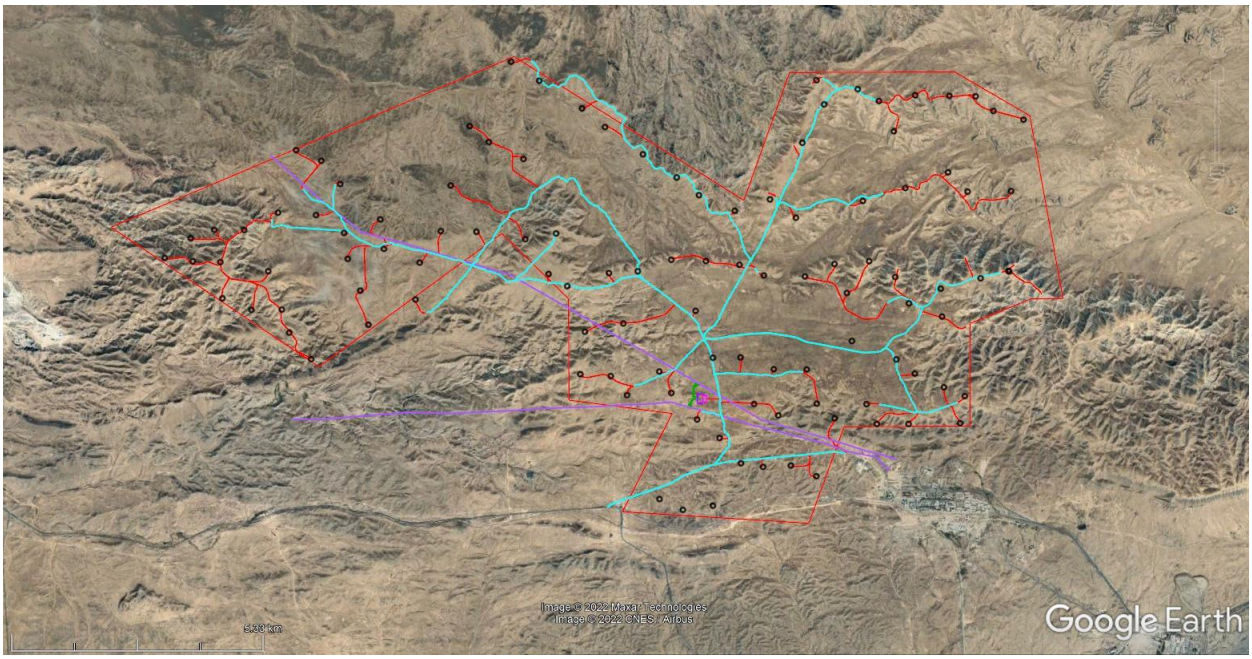

Figure 1. Proposed Project site showing all proposed turbine locations

The Developer has been asked by the panel of Lenders to provide clarity and certainty on the feasibility of managing the Project's key biodiversity risks prior to the disclosure of environmental and social documents. The risks identified include, but are not limited to, the potential to locally remove certain bird populations and have permanent effects on the viability of the adjacent Important Bird Area (Mount Aktau IBA).

The biodiversity management strategy for the Zarafshan Wind Farm (the Project) includes operational measures to reduce the likelihood of fatality (i.e. IdentiFlight®[1] triggered shutdown) as well as a follow up Bird and Bat Fatality Monitoring. The Fatality Monitoring is in place to monitor and assess the possible impacts of the Project and provide information to adapt the biodiversity management strategy as appropriate.

This protocol outlines the procedure for conducting regular, systematic searches below the Project's wind turbines for bird and bat carcasses, along with associated field and analytical procedures, in alignment with Good International Industry Practice.

The objectives of the Bird and Bat Fatality Monitoring Protocol are to:

- Provide scientifically robust fatality data relating to bird and bat turbine collision
- Quantify the unbiased mortality rates, composition, and spatiotemporal patterning of bird and bat impacts to inform safeguarding through an 'Adaptive Management Framework' detailed in the Project's Biodiversity Management Plan (BMP)

In keeping with standard practice of international lending institutions, the requirement is for the Project to conduct a minimum of three, continuous years of bird and bat fatality monitoring following this protocol. This period will be applied in a phased pattern that corresponds to the phases of construction. For each phase, the monitoring will begin at the start of first group of wind turbines operation date and will continue for a minimum of three years. After 3 years of monitoring on the first group operation date has been completed, the results of the PCFM program will be reviewed and the program extended if collision likelihood to identified priority species persists. The results of the mortality surveys will be reviewed in consultation with the Project's Lenders, at a minimum biannually (every 6 months), with review of a given 6-month period scheduled once the PCFM report for the corresponding monitoring period is available. The results of the PCFM will inform the wider review of the overall mitigation strategy. This will inform the adaptive management response.

1. Reports detailing the ongoing findings of the monitoring study will be submitted to the Lenders semi-annually (every 6 months), following the reporting procedure outlined within this protocol, and the Lender, or Lender's technical advisor may require adjustments or corrections to the reports and/or field or analytical procedures, if they are not satisfactorily aligned with this protocol.
2. The protocol will be reviewed as part of the periodic review of all aspects of the biodiversity impact monitoring in accordance with the 'Adaptive Management Framework' detailed in the Project's Biodiversity Management Plan (BMP) and included within the ESMMP.

[1] https://www.identiflight.com/

Terms of Reference

Task 1: Initial Project Setup

Before the beginning of the monitoring effort, the Team[2] will take steps to prepare for the initiation of monitoring, including the following:

- In advance of performing fieldwork, the Wind-Wildlife Expert (WWE) will develop the necessary protocols and data forms associated with the PCFM effort, and the Team Leader (TL) will recruit, hire, and resource the necessary staff of Search Technicians (ST). Once these elements are in place, the WWE and TL will conduct an initial, month-long site visit at the beginning of the monitoring period, for the purpose of providing training and direct supervision, as needed, to all personnel who will perform fieldwork associated with this Protocol (TL and ST). The primary purpose of this initial site visit at the start of the first year of monitoring is to ensure that all Team personnel are properly prepared to perform all aspects of the fieldwork successfully in accordance with this Protocol, and in compliance with the operator's policies for work activities conducted at the wind farm by staff and contractors.
- All personnel who will perform fieldwork on site associated with the fatality monitoring will participate in an on-site safety orientation required for all staff and contractors who work on site, and the Company Environmental Manager (CEM) will establish all necessary communications between the fatality monitoring Team members and project staff to ensure that all fieldwork is performed in coordination with the CEM, and following the safety and personnel procedures required by the facility, including use of personal protective equipment, facility communication and safety procedures, facility check-in, check-out procedures, and COVID-19 safety procedures.
- A minimum of five types of field data forms will be prepared by the WWE in advance of the initiation of the monitoring effort, as follows:

[2] See below under "Staffing and Resourcing" for description of roles, responsibilities, required qualifications, and other aspects of the various members of the Fatality Monitoring Team ("the Team").

- Search schedule form: One of these forms should be filled out by the ST performing the searches for each day of carcass searching, documenting which turbines were searched on a given day of searching, by whom, the date, time taken per turbine, and the turbine numbers and carcass ID numbers of each carcass discovered during the day of searching.
- Carcass Observation (CO) form: One of these forms should be filled out by the ST for each carcass discovered during the searches. This form will contain all of the information collected for each carcass, including geoposition, distance to, and orientation from nearest turbine, carcass condition, turbine number, date, carcass number, measurements (if applicable), and preliminary ID.
- Searcher efficiency trial (SE) form: One of these forms should be filled out by the TL for each day on which SE trials are performed (see Task 3 below). This form should document all of the pertinent information for each SE trial performed during the day, including the date, the nature of each SE carcass used (i.e. large bird, small bird, bat), time, turbine number, and geoposition of placement, names of the TL who placed the SE carcasses and the ST who performed the searches that day, and the result of the trial (i.e. found by ST, not found by ST but relocated later by TL, not found by ST and not relocated later by TL).
- Carcass persistence trial (CP) form: One of these forms should be filled out by the ST for each round of CP trials (see Task 3 below). This form should document all of the pertinent information for each CP, including the date of initial carcass placement, the nature of each CP carcass used (i.e. large bird, small bird, bat or surrogate), time, turbine number, and geo-position of initial placement, date and time of each subsequent visit to attempt to relocate the carcass, and result of each attempt to relocate (present or not present). Note that all CP carcasses must be fresh carcasses at the start, and each should be followed for up to a month following initial placement.
- Freezer log form: One of these forms will be required for each freezer dedicated to bird/bat specimen and/or test carcass storage located at the facility, and information on this form should be recorded by whomever removes or adds any carcasses to/from the freezer (TL or ST). The purpose of this log is to maintain an up-to- date inventory of the carcasses contained within the freezer, including both carcasses discovered and collected during carcass searches, and other carcasses obtained otherwise for the purpose of use in bias-correction experiments. The log will also be used to document when specimens are removed, i.e. for use in bias correction experiments.

- The Team will communicate with the CEM as necessary to ensure that the CEM has the information necessary to support the execution of the PCFM fieldwork in the context of, and within parameters that are consistent with the CEM's responsibilities for operation of the wind farm. This communication is expected to include direct communication between the CEM and various members of the Team, including the WWE, the TL, and the ST. The TL will be responsible for ensuring that all Team personnel performing field work (primarily the ST) are provided with the necessary materials and understanding of the protocol to initiate the work properly. Materials necessary for conducting the surveys include the following:
    - Bite-proof gloves for specimen handling.
    - Personal protective equipment (including but not restricted to hard-hat, boots, appropriate clothing for seasonal weather conditions).
    - On-site freezer for specimen storage (see "assumptions" above).
    - Field data forms.
    - Camera, scale ruler and GPS unit for photographing and georeferencing carcasses found during the searches.
    - Plastic bags, labels, waterproof writing implements for specimen collection and labeling.
    - Ruler and calipers for measuring specimens.
    - Written field protocol.
    - Safety supplies.

Task 2: Carcass Searching

The Team will conduct bird and bat carcass searching as required by this Protocol which is aligned with Good International Industry Practice. The specific design has been selected based on current science, the physical conditions of the site, and the sensitive wildlife species potentially at risk at the site, and includes the following elements:

- <u>Preparation for Carcass searching:</u> Prior to the initiation of carcass searching, The WWE and TL will physically review all search plots to perform two essential functions, as follows: i) delineation of searchability zones[3] in each search plot; and ii) completion of an initial "clearing search" to document and remove any bird and bat carcasses that may be present on site prior to initiation of the search effort, per GIIP.

[3] All substrates within the idealized search plots will be assigned to one of three classes on the basis of direct examination of the substrate: "high" searchability (expected on most road and crane pad surfaces), "moderate" searchability (expected in most areas covered with steppe vegetation), and "unsearchable" areas, with the latter category to be excluded from the ground searches and quantified in order to apply an unsearched area bias-correction factor during the fatality rate estimation process. Unsearchable areas shall include all areas containing steep slopes, tall or dense vegetation resulting in "low" searchability, per GIIP, or any other feature that precludes the execution of safe, effective carcass searching per this protocol within certain areas.

- Search plots: Search plots will be square, centered on the location of the base of a turbine tower, and the length of each side of the plot will be 172.5m, equivalent to the maximum installed blade tip height of the turbines (thus the search plot "radius" will be ½ of the maximum installed blade tip height). The extremities of each search plot will be marked using metal stakes or surveyor pegs to ensure the same areas are searched each time and to reduce search set up time on each visit. Portions of this idealized area that are unsearchable due to terrain (e.g. steep slope/canyon) will have been excluded from search plots individually for each turbine during the initial preparation for carcass searching, conducted by the WWE and the TL (see above).
- Number of turbines searched: All 111 of the turbines (see Figure 1) will be searched during each round of searching. Note that each turbine-search entails roughly 3.3 km of walking and is expected to take approximately 45 minutes, depending on the number of carcasses discovered. Hence each ST is expected to be able to complete a maximum of 7 turbine searches in a single, 8-hour day of fieldwork, including allowance for lunch breaks and travel between turbines. Thus, each complete round of carcass searches will require 16-person x days of effort, and a minimum of three ST[4] working in parallel (on different turbines) will be required in order to realize weekly searching of all turbines following this protocol, and assuming that ST will work a maximum of 5 days per week.
- Search frequency/interval: Searching will be conducted once per week at each of the turbines throughout the course of the study. Note that because of the importance of maintaining a constant search interval for the fatality rate estimation, it is important that the searches be conducted at regular, one-week intervals at each turbine, requiring careful attention to the scheduling and sequencing of turbine searches. Some deviation from this schedule is inevitable due to the realities of fieldwork and scheduling, but deviation should be minimized as much as possible. If CP trials identify unexpectedly short carcass persistence rates, then the search intervals will be adapted accordingly, and the protocol documents updated to reflect this.
- Study duration: The Company expects to complete a minimum of three years of fatality monitoring. The findings of the surveys should be reviewed by the WWE and shared with the Lenders at the end of each 6-month monitoring period[5].

[4] Note that in order to sustain an effort entailing at least 3 ST deployed on the search effort 5 days/week year-round, it will be necessary for the TL to hire more than 3 STs, i.e. to accommodate vacations, sick leave, etc.

[5] Once the semi-annual report for the corresponding monitoring period is available, which will typically be 2 months subsequent to the completion of the fieldwork for the monitoring period, in order to allow time for data entry, qa/qc, analysis, and reporting.

- <u>Search procedure and documentation:</u> ST should walk along straight line transects extending from one boundary of the search plot 185m to the opposite boundary, with such transects spaced at 10m intervals (Figure 2). Because the search area covered by each transect extends out 5m from the transect, the first transect should be located 5m in from the corner of the search plot, and subsequent transects should be located at 10 m intervals thereafter, in order to provide 100% coverage of the ground surface of the search plot, thus requiring 18 transects per plot. ST should walk at a moderate pace while searching, scanning the ground for bird and bat carcasses out to 5 meters on each side of the ST's path. Such searches will entail 3.33 km of total linear searching per plot and are expected to take roughly 45 minutes each for a single person, or 20-25 minutes for two ST working together. The time taken may vary depending on the number of carcasses discovered during the searches and the corresponding increase in data recording required. On each day of carcass searching, the ST should fill out a carcass search effort data sheet, documenting the date and time of each individual turbine search, and also indicating which carcasses were discovered on each search (see carcass search data form description under Task 1).
-

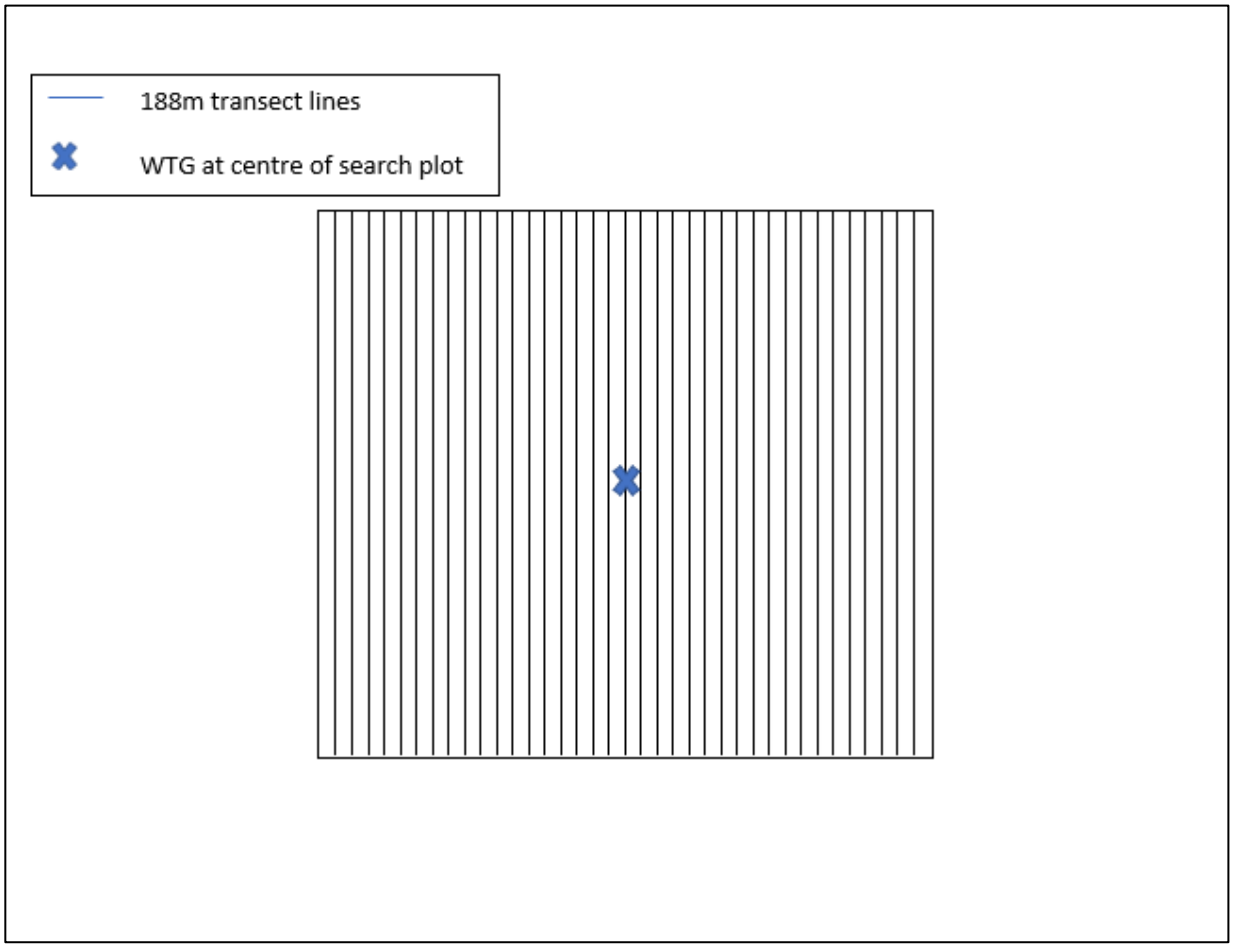

Figure 2. Idealized carcass search area in relation to a turbine

- Specimen collection and documentation procedure: For all bird and bat carcasses found through the search effort, including both in-plot and off-plot (incidental) carcass discoveries, the ST should first record the precise location of the carcass using a GPS unit, then prepare a label to include with the carcass for storage, and alongside the carcass in photographs. The label should contain a unique carcass ID number, as well as the date, time, GPS coordinates of the carcass discovery point, and turbine number where discovered. The ST should then take a minimum of 4-6 photographs of the specimen[6], showing the animal from as many different angles, and as completely and clearly as possible, also including a ruler for scale and the carcass ID label in all photographs, in order to facilitate subsequent carcass identification by taxonomic experts. Once geo-position is recorded and photographs are taken, the carcass should be placed along with the carcass label, inside of a plastic bag, and then at the end each day of searching, the bags containing all specimens collected that day should be placed within the dedicated carcass storage freezer. The ST should also fill out a carcass information data sheet containing all of the required information on each carcass (see carcass information sheet description under Task 1). ST should handle all carcasses with bite-proof gloves, in the event that live bird or bat carcasses are discovered, and to prevent injuries from abrasions with sharp claws/beaks of dead animals.
- Specimen identification: All bird and bat specimens discovered during the carcass searches should be identified by qualified taxonomic experts to the finest taxonomic level possible. This may be accomplished to a large degree for many specimens through examination of photographs by experts. However, there should also be an allowance within the monitoring protocol for local and national taxonomic experts to visit the site on a periodic basis to examine collected specimens from the freezer, as necessary, for taxonomic identification of specimens that cannot be definitively identified from the photographs.
- Definition of collision impacted animals: For the purposes of analysis and reporting, all birds or bats found dead within the ground search or scanned areas will be regarded as likely collision fatalities resulting from the facility. Discovery of any bones or body parts will be counted as a collision fatality. Discovery of a "feather spot" consisting of at least 10 feathers of any type, or at least 5 flight feathers (wings/tail) within a 2 x 2 m area at one time will be regarded as a collision fatality. Discovery of an injured bird or bat within the search area will be handled following a specific protocol that is developed for such prior to the initiation of surveys[7]. From the standpoint of fatality estimation, such discoveries will be documented and regarded as collision fatalities.

[6] As a part of fieldwork preparation, the WWE is expected to prepare written guidance for the ST to instruct them on proper photographic documentation of discovered carcasses. This aspect should also be included as an element of the in-person training conducted by the WWE during the initial site visit.

[7] The protocol for responding to discoveries of injured animals during the searches should be developed by the TL prior to the initiation of surveys, and should be aligned with applicable laws and policies relating to biodiversity, animal welfare, and health and safety. This protocol should also incorporate research into any available veterinary, or animal rehabilitation resources that may be available to treat injured animals, in accord with the protocol.

Task 3: Bias-correction Experiments

The Team shall perform two kinds of bias correction experiments in association with the carcass search effort, using the following procedures:

- Searcher efficiency (SE) bias correction experiments: The purpose of SE trials is to quantify the proportion of carcasses that are present within the search areas at the time searches are conducted, but that are not detected by the ST. The procedure for conducting these trials is as follows:
    - SE trials will be conducted within the search plots.
    - SE carcasses should be placed in the search areas by the TL, on the same day that searching is conducted at that turbine by a ST. Note, this requires advance coordination between the TL and ST so that the TL can place the SE carcasses unbeknownst to the ST, to ensure that the search effort is unbiased.
    - Ideally, SE carcasses will be bird and bat carcasses discovered during earlier searches and already identified by taxonomic experts. Such carcasses should be kept in the on-site freezer specifically for use in SE (and CP, see below) experimental trials.
    - If insufficient actual carcasses are available or have not yet been identified by taxonomic experts, suitable surrogates may be used, which may include bird or bat carcasses obtained outside of the carcass search effort, or a variety of stuffed animals or plastic/wooded models selected to mimic the size and visual appearance of actual bird and bat carcasses. (Note, "large birds" are defined as equal to or larger than the size of a Rock Pigeon (Columba livia)).
    - A minimum of 10 SE trials (placement of one experimental carcass = one trial) should be conducted for each carcass class in each substrate visibility class in each pertinent season. SE trials will only be necessary for bats during spring, summer, and autumn seasons, but SE trials for small and large birds will be necessary in all four seasons, hence roughly 220 SE trials will be conducted each year, assuming two visibility classes.
    - Experimental carcasses should be marked with a piece of black tape on the leg, or some other similar marker that makes it very clear to the searcher upon discovery of the carcass that it is an experimental carcass, but that does not increase the visibility of the carcass from a distance.
    - No more than two experimental carcasses (inclusive of both SE and CP trials, see below) will be placed at any one turbine on any one day, in order to avoid undue attraction of carcass scavengers.

- The best procedure is to conduct small numbers of SE trials very frequently over the course of the monitoring effort, for example with small numbers of SE trials incorporated into each day of carcass searching, year-round. Alternatively, SE trials may be completed during a smaller number of clustered events, with larger numbers of experimental carcasses placed in the field during a smaller number of days of experiments. In accordance with best practice, SE trials should be conducted on a minimum of 8 separate days over the course of a year, in order to capture possible seasonal variation in carcass detectability (i.e. due to seasonal growth of vegetation). If trials were conducted on 8 separate days, then roughly 28 of the 220 annually required individual trial carcasses would be placed on each day of trials.
- Experiments will be conducted without the searcher's prior knowledge, and the searcher will not be present when experimental carcasses are being placed in the field.
- The TL should place the experimental carcasses at randomly selected locations within the search areas, stratified by substrate visibility class, and at randomly selected turbines. The TL should then record the location (geoposition) of each experimental carcass placed in the field, and fill out a SE trial data form, to be completed when results of the trials are finalized after the searching, later in the same day (see description of SE data form under Task 1).
- When the searcher discovers a carcass marked with a piece of black tape on the leg, he/she should notify the TL, and should collect the carcass per normal protocol. This enables the re-use of experimental carcasses, and it allows the TL to not have to search subsequently for experimental carcasses that have already been discovered and retrieved by the searcher during the search effort.
- As soon as possible after the searcher has completed the searches (must be the same day, ideally within 1-2 hours), the TL will visit the locations of all unfound experimental carcasses, in order to determine whether any unfound carcasses are still present in the field. Any SE carcasses that were not found by the searcher and also not subsequently relocated by the experimenter will be eliminated from the analysis, not regarded as viable SE trials, as the SE carcass may have been removed by a scavenger prior to the search. Only the SE trials discovered by the searcher, or those missed by the searcher but subsequently relocated by the experimenter will be regarded as legitimate SE trials.

- <u>Carcass scavenging bias correction experiments:</u> These experiments, also referred to as "carcass persistence trials" (CP), will be conducted as follows:
  - All CP will be conducted within the regular ground search areas.
  - Experimental carcasses will be placed in the search areas by the ST (note, there is no need for the TL to conduct CP trials as in SE trials).
  - Actual carcasses discovered during earlier searches and already identified by taxonomic experts will be used as experimental carcasses as much as possible.

- If insufficient actual carcasses are available or have not yet been identified by taxonomic experts, suitable surrogates will be used, which may include mouse or other bird carcasses, as available. Note, the key criterion for suitability of a carcass for CP is appearance to scavengers, which includes smell, as well as visual appearance. CP carcasses must, therefore, be fresh, and they should be feathered/haired. Unlike SE carcasses, CP carcasses may not be reused.
- A minimum of 220 CPs (placement of one experimental carcass = one trial) should be conducted over the course of the year, spread as evenly as possible over the year, and divided roughly evenly among "high" and "moderate" substrate visibility classes, and among small birds (smaller than a Rock Pigeon, Columba livia), bats, and large birds (Rock Pigeon sized or larger), respectively. We note that no CP will be necessary for bats during the winter, hence this target sample size will allow for a sample size of 10 for each pertinent carcass class in each season, in each substrate visibility class.
- Experimental carcasses will be marked with a piece of black tape on the leg, or some other similar marker that makes it very clear to the ST upon subsequent monitoring visits that it is an experimental carcass, but that does not increase the visibility of the carcass from a distance.
- No more than two experimental carcasses (inclusive of SE trial carcasses, see above) will be placed at any one turbine on any one round, in order to avoid undue attraction of carcass scavengers.
- The ST will place the experimental carcasses at randomly selected locations within the road-and-pad search areas, and at randomly selected turbines.
- The ST will record the location of each experimental carcass placed in the field on a CP data form (see description under Task 1), and will visit the locations of each experimental carcass once per day for at least 5 days subsequent to initial placement of the experimental carcasses in order to document whether or not each carcass remains in the field.
- Subsequent to the first week after experimental carcass placement, the ST will continue to revisit the locations of all experimental carcasses that have not yet been removed by scavengers on previous visits on a weekly basis for up to three additional weeks, in order to document carcass persistence for up to a month for each experimental carcass. This may be done in conjunction with regular carcass searching fieldwork.
- The results of each CP carcass relocation attempt will be recorded by the ST on the CP data form until all of the CP carcasses have disappeared, or one month has passed since initial placement.

- Resulting data on CP will be used to construct carcass persistence functions over time, separately for each of the three taxon/size classes (large birds, small birds, bats), and separately for each season. These functions can then be used to estimate the proportion of bird and bat collision fatalities that remained in the field unscavenged when ST came looking for them, which is equivalent to the value on the carcass persistence function at the point of time equivalent to one half of the search interval. This is because if carcasses fall at random times, the average carcass needs to persist in the area for one half of the search interval in order to be available for discovery by the ST.

Task 4: Fatality Rate Estimation

As part of the analysis of results for each semi-annual (6 month) report (see under "reporting" below), the Team should estimate total, bias-corrected bird and bat fatality rates for the Project for the monitoring period, using GenEst[1] software.

At a minimum, the estimation method should include the following corrections of the raw carcass search data:

- Correction for searcher efficiency bias (see SE protocol section).
- Correction for carcass removal by scavengers (see CP protocol section).
- Correction for unsearched areas of searched turbines.

Fatality rate estimates should ideally be conducted separately for each season, for each substrate visibility class, and for each of the three taxon/size classes, and then aggregated, as fatality rates and bias correction factors may vary substantially across seasons and across taxon/size classes. It is expected that sample sizes of discovered carcasses will only permit statistically robust, bias-corrected fatality rate estimates for 6-month periods in GenEst[8] for species pooled within the three carcass classes (bats, small birds, large birds). In order to estimate fatalities of individual species, raw numbers of discovered fatalities for individual species will be multiplied by the total bias correction factors pertinent to the applicable size class, season, and substrate searchability type, and then aggregated to produce total estimated fatality rates for the species.

Task 5: Reporting

The Team will be required to fulfil the following reporting requirements:

- Monthly Summaries: **Within one week of the completion of fieldwork for each month**, the TL should submit an email to the WWE and the CEM, containing the following information:
    - Days on which carcass searching was conducted during the past month.
    - Name(s) of the ST.
    - Description and justification for any deviation from the basic plan of searching each turbine once per week at regular, one-week intervals.

[8] https://www.usgs.gov/software/genest-a-generalized-estimator-mortality

- Table containing basic information for each carcass discovered during the month of searching, indicating date, turbine number, preliminary ID, location (within ground search plot or "off plot" carcass discovery), carcass condition.
- Table containing basic information for each SE trial conducted during the month, including date, turbine number, and result of SE trial.
- Table containing basic information for all CP activity during the month. For all CPs initiated during the month, indicate turbine number, date of placement, and carcass category. For all CPs initiated during earlier months but completed during the current month, indicated date of initial placement, turbine number, carcass category, and minimum carcass persistence (= # of days after initial placement when carcass was relocated for the last time during CP checks).

- Semi-Annual Reports: It is expected that the Lenders will provide a template for Team to follow for the production of semi-annual (every 6 months) reports. These reports should be clear, complete, and comprehensive, and written in English, covering a 6-month monitoring period, and the template will specify the required information content, expected to include comprehensive detail on the field and analytical methodologies applied, effort level/sampling structure realized during the period, and results, including final taxonomic identifications of all specimens and bias-corrected estimates of total fatality rates for three carcass size classes for the period. In the first year, the semi-annual reports will be prepared by the WWE, using inputs provided by the TL, and working closely with the TL on report preparation, in order to build the TL's capacity for preparation of satisfactory semi-annual reports, including data analysis in GenEst, so that the TL can successfully assume reporting responsibility in years 2 and thereafter, as anticipated. A draft of each semi-annual report should be submitted within 2 months of completing carcass search fieldwork for the reporting period.

Staffing and Resourcing

We have estimated that a team of six on site staff would need to be employed full time as ST in order to fulfil the daily searches under WTGs, with an additional TL to manage and supervise these staff, under the direction of the WWE. Transport would also be required for the TL and ST, however purchase of these vehicles would not be a yearly cost, estimates for vehicle fuel have been based on each vehicle using roughly half a tank of petrol per week. Further to this we have assumed that the TL would be required to be physically present on site roughly one week per month to perform SE bias correction trials and for ST staff oversight and support.

Year 1 costs are estimated to be approximately 234,700 USD with running costs for subsequent years likely to reduce to below 200,000 USD, due to more limited need for involvement of the WWE. A breakdown of the outline cost estimate for Year 1 is shown below.

Table 1: Outline Costs for Year 1

Item	**No.**	**Cost**
Search Staff (Search Technicians)	6	$43,200.00
Team Leader	1	$60,000.00
Vehicle purchase (up to 6 as worst-case)	6	$30,000.00
Vehicle running cost (up to 6)	6	$6,500.00
Wind-Wildlife Expert	1	$95,000.00
Year 1 Cost		**$234,700.00**

Assumptions

Assumptions made include:

1. The monitoring will be performed by the Fatality Monitoring Team (the Team). The Team will be directed by an external Wind-Wildlife Expert (WWE) who possesses the necessary experience and qualifications for developing and implementing the protocol successfully, but who is only expected to be physically present at the site for one month per year, to provide initial training and periodic supervision. The carcass searches will be performed by locally based (e.g. in Zarafshan) Search Technicians (ST), who are directly managed and supervised by an Uzbekistan-based Team Leader (TL), who is expected to be physically on site roughly one week per month for supervision, and to perform SE experiments, but who may be based elsewhere within Uzbekistan during the remainder of his/her time.

2. The WWE will be external to the Company and will serve as the primary POC with the operator, and will provide the Team with protocols for works, and conduct a one-month site visit near the beginning of the first year of monitoring and mid-way through year two for the purpose of providing training and direct guidance/oversight of the implementation of the field protocols and data pipeline, as the monitoring commences. The WWE will perform ongoing supervision of the protocol and data pipeline on a remote basis in coordination with the TL for the remainder of those years. In years 1 and 2, the WWE will also be responsible for completing the semi-annual reporting requirement, including the estimation of bias-corrected, total fatality rates for three carcass classes for the monitoring period. The WWE's effort on the reporting task will serve the dual purpose of building reporting capacity in the TL, with the expectation that primary responsibility for semi-annual reporting, including data analysis in GenEst, will be transferred to the TL in year 2 and beyond. Required qualifications for the WWE include i) minimum 3 years of prior experience with bird and bat fatality monitoring at wind farms following Good International Industry Practice field and statistical methodologies; ii) scientific credentials and demonstrated capacity for conducting quantitative statistical analyses of scientific data, as well as production of professional-quality scientific reports in English.
3. The Team Leader (TL) will be external to the Company, and will have primary responsibility for staffing, resourcing, and managing the day-to-day implementation of all field protocols, as well as the data pipeline. The TL will be responsible for completing the monthly reporting requirement and will also be responsible for taxonomic identification of bird and bat carcasses discovered during the search effort. In year 1, the TL will support the WWE in the preparation of semi-annual reports, with the TL taking over full responsibility for semi-annual reporting in year 2 and beyond. The TL is expected to be physically present on site for roughly 1 week per month during the monitoring effort, for the purpose of conducting SE bias correction trials, and providing direct supervision and support of the ST staff. Aside from this time, the TL may be based elsewhere in Uzbekistan. Required qualifications for the TL include bachelor's level or higher degree in ecology or a related scientific discipline from an accredited college or university; regional taxonomic expertise in birds and bats of Uzbekistan[9]; capacity to recruit, train, manage, and resource a staff of ST; capacity to perform quantitative and qualitative analysis and presentation of scientific data, including simple statistical analyses; and capacity to produce professional quality reports in English, including production of georeferenced map figures.

[9] May be through subcontracted national biological experts

4. The Search Technicians (ST) are expected to be employed or contracted by the TL, and will be expected to be based locally in the vicinity of the Project (i.e. in Zarafshan) during the period of their work on the Project. They will be recruited and managed by and will report directly to the TL. ST must be capable of performing rigorous and strenuous fieldwork at the site, including in adverse weather conditions. ST must also be capable of correctly filling out the required fieldwork data forms, and performing all aspects of the field protocol, including taking GPS points, photographs, and recording data on all carcasses discovered during the search effort, following the protocol.
5. The Team will have permission to access, and perform the necessary field surveys on the site, working within the safety and operational protocols that the Company has established for all staff and contractors working on the site.
6. The Company will maintain one or more chest freezers on site, as necessary (likely within the main control building) throughout the course of the monitoring effort, dedicated for use by The Team for specimen storage[10]. The freezer(s) will be used to store both carcasses discovered during searches and also to store test carcasses to be used for SE and CP trials.

[10] Consultation with the institute of Zoology has stated that there is no specific regulation for keeping samples of rare/protected species. This will be confirmed with the State Committee for the Environmental and Ecological Protection, Uzbekistan Veterinary Committee and Service of Sanitary and Epidemiological Welfare and Public Health of the Republic of Uzbekistan.

Annex 1. WTG locations

ID	Easting	Northing	ID	Easting	Northing	ID	Easting	Northing
T1	613433	4602928	T39	616362	4604351	T77	621888	4599388
T2A	618866	4605558	T40	616613	4603259	T78	621865	4600904
T3	608169	4603708	T41	616859	4606973	T79	622190	4603809
T4	623660	4605420	T42	616915	4601431	T80	622247	4600603
T5	608758	4603649	T43	616997	4602317	T81	622456	4603211
T6	608698	4604129	T44	617347	4606592	T82	622616	4607453
T7	609349	4603642	T45	617479	4603545	T83	621576	4603541
T8	609199	4604309	T46	617552	4601404	T84	622767	4605132
T9	609397	4602888	T47	617799	4602503	T85	622913	4603880
T10	624953	4601110	T48	617900	4601014	T86	622902	4600911
T11	609830	4604315	T49	618081	4603592	T87	623066	4607214
T12	610006	4602658	T50A	618150	4606031	T88	623126	4600505
T13	610353	4603466	T51-R	618614	4598864	T89	623395	4606595
T14	610518	4604693	T52	618565	4601515	T90	623513	4601849
T15	610651	4602674	T53	618778	4603842	T91A	623463	4603560
T16	610808	4602196	T54	618824	4601075	T92	623788	4600514
T17	610869	4606007	T55A	619336	4605198	T93A	623753	4603018
T18	611267	4601650	T56	619304	4602789	T94	623829	4607354
T19	611320	4604655	T57	619372	4600533	T95	623903	4601562
T20	611402	4605792	T58	619501	4603829	T96A	624415	4603335
T21	611813	4605312	T59	619680	4601822	T97	624452	4602754
T22	611920	4604290	T60	619847	4600155	T98	624517	4601285
T23	612007	4603753	T61	620089	4604884	T99	624553	4605763
T24	612275	4603094	T62	620203	4603761	T100	624553	4607354
T25	612449	4602386	T63	620256	4601838	T101	624873	4600544
T26	612668	4604589	T64	620302	4599638	T102	624973	4605368
T27	612757	4603974	T65	620554	4600876	T103-R	619104	4598652
T28	613513	4603698	T66A	620819	4605131	T104-R	619730	4598750
T29	613942	4604361	T67	620714	4603547	T105	625108	4607360
T30	614129	4605319	T68	620767	4599568	T106A	625247	4603564
T31	614504	4606568	T69	620955	4601604	T107	625495	4607064
T32	614691	4604361	T70	621064	4600647	T108A	625828	4603726
T33	614914	4606240	T71A	621477	4606319	T108B	625846	4603715
T34	615351	4607929	T72	621351	4599603	T109	625892	4605396
T35	615719	4604221	T73	621365	4604759	T110	626138	4606896
T36	615947	4607541	T74	621644	4601609	T111-R	622577	4602217
T37	615648	4605897	T75A	621748	4607625			
T38	616219	4603505	T76	621921	4607126			